RAMP 1992-1999

RUSSIA AIR MANAGEMENT PROGRAM

Final Report

Mother Russia

ACKNOWLEDGMENTS

Many people and organizations shared responsibility for the success of the Russia Air Management Program (RAMP). Thanks should first go to the visionaries from Russia and the United States who originated the idea of testing American air quality management techniques in Russia. Their farsightedness has been validated by the success of the project and the enthusiasm of its participants. This vision was shared by the organizations who funded and supported parts of the project: US AID, US EPA and the World Bank.

We are grateful to all of the participants in the project, both Russian and American. Our Russian colleagues have been dedicated to working for a cleaner environment for years. People like Dr. Mark Berlyand, who has had a long pioneering career at the Main Geophysical Observatory in St. Petersburg since 1942, is representative of many who have worked for many years for the environment. The project participants from both Russia and the United States willingly shared their knowledge and experience with each other and found that they gained much in the process.

Our colleagues at Science Applications International Corporation (SAIC), Eastern Research Group (ERG) and the Institute for Sustainable Communities (ISC) brought their technical abilities and experience to the project but they also added an incredible level of personal commitment to help make RAMP a successful project.

After reading the report that follows, it will be clear that it took a huge team to do this successfully. The administrative support in the United States was highly professional and capable for the routine tasks, such as travel arrangements and visas, and tremendously responsive in the exceptional cases, such as serious illnesses halfway around the world. The translators, drivers, and logistical support people in Russia were absolutely essential to the ability of the American personnel to be effective there.

The US EPA managers deserve everyone's gratitude for their enthusiastic tolerance of the "other project" which often made it necessary to adjust schedules. Fortunately, they shared the vision of the need for this kind of effort and led the way for everyone.

In the end, the most important accomplishments went beyond the sharing of technical knowledge. It was the development of respect and longlasting relationships between Russian and American colleagues. We found that we have many more things in common than differences and ultimately we all share the goal of a better environment.

COLLABORATION

COMMUNICATION

CHANGE

The Russia Air Management Program (RAMP) began in 1992 following preliminary investigations into the air management system in the former Soviet Union by US project initiators. The effort was conceived as a four-year cooperative program among the Russian Ministry of Environmental Protection and Natural Resources (MEPNR) and the US Environmental Protection Agency (US EPA) to improve national institutions, policies, and practices for air quality management in Russia. The program was part of the Environmental Policy and Technology project conducted by the US Agency for International Development (US AID).

In 1992, the World Bank had contacted the US EPA to discuss collaboration on an air pollution management project in the former Soviet Union (FSU). US EPA personnel subsequently held meetings with Byelorussian and Russian colleagues to review the air management system in the FSU and to identify areas of potential collaboration. Following further discussions with local political and environmental authorities throughout western Russia, the city of Volgograd was chosen as the site for the RAMP pilot project.

The Volgograd pilot project featured the development, practical demonstration and evaluation of alternative approaches for improving air quality management policies and practices in Russia. Volgograd has a progressive and environmentally enlightened local government, and a diverse industrial base. It is located south of Moscow on the Volga River and was proposed by the MEPNR. It was selected after a site visit and a series of discussions with the Ministry, Volgograd officials, the World Bank, and the US EPA. Following the pilot, RAMP's intention was to facilitate implementation of selected parts of the pilot in other areas of Russia using training, technology transfer, and public awareness.

The project was divided into components conforming to the fundamental structure of mature air quality management programs, with leadership roles assigned to US EPA personnel with expertise in specific aspects of air quality management. Additional technical and administrative support was provided by two US contractors, Eastern Research Group (ERG) and Scientific Applications International Corporation (SAIC), one US non-profit organization, the Institute for Sustainable Communities (ISC), as well as three main Russian subcontractors, Scientific Research Institute — Atmospheric Air Protection (SRI AAP) and Main Geophysical Observatory (MGO) in St. Petersburg, and Institute Agroproject (IA) in Volgograd.

Air Quality Management in Russia

The initial step for RAMP was to make a quasi-comparison of Russian and American air quality management systems. Although the break-up of the Soviet Union exposed a country that had experienced years of environmental neglect, it was also quite clear that a very sophisticated system of environmental measurement and control was in place, managed by highly qualified technical experts. American and Russian experts needed to begin by understanding each other's work. That became the first priority for RAMP.

As might be expected, there are significant differences in the Russian and American systems of air quality management. Air quality management in the Russian Federation has been oriented towards the control of stationary sources with a rather modest emphasis devoted to area or mobile sources.

The main elements of the Russian system include:

- ambient air quality norms or standards for more than 1,000 pollutants
- ambient air quality monitoring
- emission inventories
- establishing maximum permissible rates for the enterprises (industries)
- establishing sanitary protection zones around the enterprises where the ambient concentrations can be higher than the maximum permissible concentrations
- permits and ecological passports for enterprises.

Russia, as part of the former Soviet Union, established air quality norms, or standards, for over 1,000 pollutants. Maximum Permissible Concentrations (MPC's) were established for over half of these, for a range of measurement periods. The other norms are considered to be guidelines only and may be used to establish temporary MPC's where none have been established. The Ministry of Public Health (MPH) establishes MPC's and typically establishes 5-10 new ones per year. They do not routinely review an MPC once it has been set. The MPH has determined that some pollutants are more harmful when present with other pollutants than when found alone in the atmosphere.

The MPC is used in combination with the prescribed air quality model to determine the Maximum Permissible Emission Rate (MPER) and to establish the level of control equipment needed on the pollutant source(s) in the enterprise. Once the enterprise begins operation there is no legal requirement for the enterprise to give routine feedback on the effectiveness of the control measures by monitoring and comparing the measured pollutant concentrations with the MPC's.

Ambient monitoring is done by the State Committee on Hydrometeorology (Hydromet), the Sanitary Epidemiological Service and enterprises, using approximately 1900 stations. These monitoring stations typically monitor for some or all of the following: dust, sulfur dioxide, oxides of nitrogen, carbon monoxide, ammonia, hydrogen sulfide, phenol, hydrogen fluoride, formaldehyde, and benzo(a)pyrene, as well as metals and other pollutants, as necessary.

Hydromet operates stations on a regular basis in 402 cities. The Main Geophysical Observatory (MGO) in St. Petersburg is the repository of this air quality information, regularly publishing Federation-wide trends and analyses reports.

Emission measurements, on the other hand, are usually conducted by the enterprises themselves. Enterprises have to put together a Technical and Economic Assessment (TEA) in order to obtain approval to build a new facility or modify an existing one. The air quality analysis for the TEA consists of a screening level modeling analysis and includes identification of pollutants and emissions, determination of background concentrations, and modeled maximum estimated concentrations.

Each enterprise has a sanitary protection zone (SPZ) surrounding it. This is analogous to the fence line of the property surrounding a stationary source in the United States and is an area where the maximum permissible concentrations may be exceeded. Russian law forbids people from living in these areas. However, this law is often violated so that workers may live close to their work. In Volgograd, for instance, apartments and schools have been built adjacent to the Red October Steel Mill, well within Red October's SPZ.

Maximum permissible emission rates are set for each pollutant at each emission point in an enterprise. Many enterprises are constructed with relatively little emission control, however, based on the premise that the SPZ can simply be extended from the facility to include all areas where ambient impacts exceed MPC's.

Environmental passports (permits) are negotiated each year by the enterprises and the pollution control agency. Enterprises are assessed fees based on exceedances of the maximum permissible emission rates. These fees recently have had little meaning because the fee levels were set prior to inflationary times and are now token amounts. In some rare cases enterprises have been closed for violations. Inspectors and enterprise officials often have friendly relationships, much more so than in the United States. Inspections are routinely scheduled ahead of time and the emission testing is usually done by the enterprises themselves. Inspectors can levy fines but, as mentioned above, they are often of token amounts.

Prior to the break-up of the Soviet Union, one ministry directed all environmental programs. That ministry was split up so that RosHydroment is now responsible for monitoring, modeling and air quality data, while the State Committee for Environmental Protection (SCEP), formerly the Ministry, is responsible for emissions controls. There is usually very little communication between the two. In addition, technical institutes in St. Petersburg (similar to US EPA's Office of Research and Development) serve both of these agencies but have very little real interaction with each other.

THE RUSSIA AIR MANAGEMENT PROJECT (RAMP)

The Russia Air Management Project (RAMP) was designed to reflect the American air quality management process by applying each component of that process to Volgograd. Senior US EPA specialists in each technical area were chosen to work with their counterparts in Russia to test the application of American techniques to the Russian situation. The Russians could then evaluate the success of these and choose which might possibly be adapted and applied Russia-wide.

US EPA and the Ministry developed the strategy for the project together and selected Volgograd as the pilot city. Volgograd is an important industrial city with a strong local environmental program, a diverse industrial and economic base, and experienced citizen environmental groups. The industrial mix in Volgograd offered the opportunity to try a variety of control strategies.

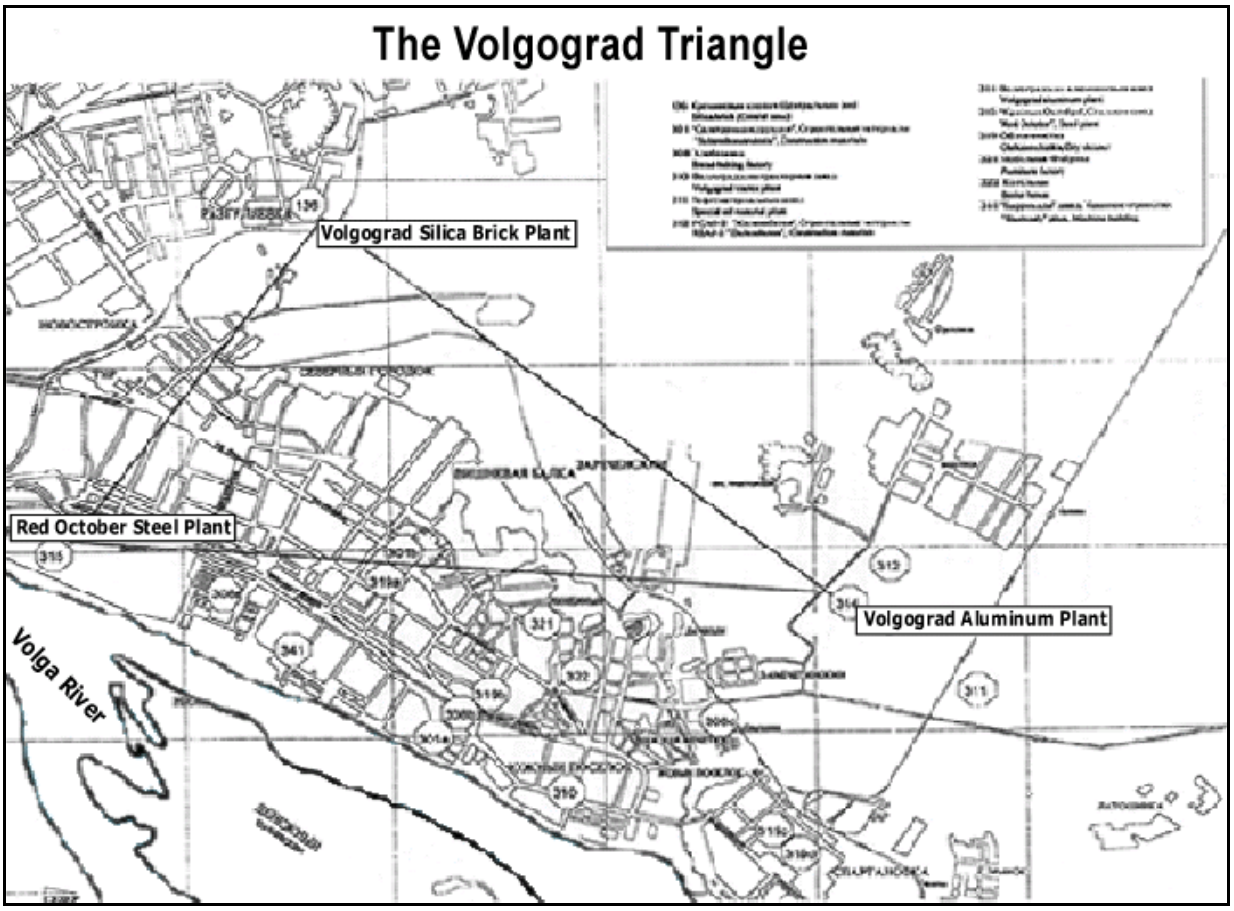
The Ministry and US EPA settled on three elements as the basic strategy for RAMP. First, the US air quality management components would be applied to situations in Volgograd. This would culminate in the development of control strategy alternatives for Volgograd. Second, successful components would be considered for incorporation into national policies and legislation. Third, project results would be disseminated throughout Russia through training and public outreach.

The entire gamut of American air quality management techniques was translated into project components in Volgograd. Russian and American team leaders were selected for each component and together planned their work, which often included assistance by American technical contractors.

AIR QUALITY MONITORING

Ambient air quality monitoring is a substantial portion of the foundation for the entire air quality management process in the United States for it is often how problems are first detected. Monitoring results are reconciled with the modeling analysis to determine where emission reductions must be made and used to assess and manage the efficiency of implemented measures. The amount of time available and budget made it impossible to do the kind of full-scale monitoring analysis that would have been preferred. In its place, RAMP component leaders suggested performing a series of saturation studies, i.e., intensive short-term studies of portions of

The Volgograd Triangle



the city of Volgograd, including the area defined by the location of three important enterprises — Red October Steel Mill, the Aluminum Reduction Plant and the Silica Brick Plant - The Volgograd Triangle. This surrogate for a long-term monitoring study gave the Volgograd specialists the opportunity to apply the American study techniques with the monitoring and analysis equipment and to understand how the monitoring step fits into the overall air quality management process.

Source Assessments & Low Cost Measures

Volgograd is a large industrial city—too large for RAMP to examine each of its major enterprises. The northern part of Volgograd became the focus of the project and nine important enterprises there were targeted for source assessments. Teams made up of Volgograd Committee staff, US EPA component leaders and American contractors conducted source assessments to identify potential low cost/no cost pollution prevention measures.

Detailed plans for low cost measures were developed and implemented for three major sources in Volgograd—the Aluminum Reduction Plant, the Silica Brick Plant and the Red October Steel Plant. Generic low cost measures and plans for these source categories were developed and published for Russia-wide use.

Emission Inventories & Emissions Factors

Most Russian inventories are cumbersome, noncomputerized documents. The cumbersome format makes them relatively inaccessible and difficult to use. RAMP's goal was to help computerize inventories, standardize the data, and streamline the format to make them more useful and compatible with standard international practice. In Volgograd, the objective was to prepare a new point and area source inventory for the northern part of the city.

Emission factors are the basis for estimating emissions that are not actually measured. They complement source testing as the means by which emissions data are compiled into emission inventories. The current Russian system is different from that of the United States and western European countries. By sharing American techniques with their Russian counterparts, RAMP hoped to suggest improvements in the Russian methodologies that would bring more comprehensive and accurate coverage for current emissions processes.

Emission Testing

Source testing is vital to the air quality management process because reliable emissions data are the starting point for virtually all of the analytical procedures and management practices involved in air quality management. RAMP carried out source testing at key enterprises to support the development of a control strategy, to support enforcement, and to develop and refine emission factors.

Risk and Health

Russia has set health-based standards, called Maximum Permissible Concentrations (MPC's), for over 1,000 air pollutants. Most other countries focus on a very small number of priority pollutants. The burden for trying to manage for this number of pollutants is challenging.

One of the goals of RAMP was to begin to prioritize pollutants to be regulated based on their toxicity and potential for human exposure. By looking at specific enterprises and the priority pollutants emitted by them, a cost-effective control strategy could be developed for Volgograd.

Strategy Development

After taking into account all of the joint work described above, the RAMP team in Volgograd developed control strategy options for the "Triangle" area—the area delineated by the locations of the aluminum reduction plant, the silica brick plant and the Red October steel plant. The source assessments at the nine major plants were analyzed and these three plants were selected as the most important from a health risk standpoint and where promising results were possible. Several scenarios were developed for different levels and combinations of control strategies which would improve air quality and reduce health risk in Volgograd. The first phase looked at near-term, no-cost and low cost measures—essentially pollution prevention measures. The second phase identified longer-term, more costly measures. The objective of the exercise was to integrate all elements of the American air quality management process in Volgograd.

Compliance and Inspection

The Russian compliance and enforcement system appears on the surface to be very similar to many other countries. Permits are issued to factories (enterprises) and emissions limits are set. Inspectors periodically check the enterprise's compliance with the emission limits and permit conditions. Lack of compliance results in penalties, which include fines, administrative sanctions, and even possible closure and imprisonment of enterprise officials.

In reality, however, enterprises often ignore permit conditions and rarely attempt to come into full or rapid compliance. The recent inflation has made fines set previously to be almost trivial amounts of money, easily ignored by the industry. Besides that, local government officials do not want to interfere with the operating enterprises since so many are not operating or face economic difficulty.

US EPA's approach to compliance and enforcement in Volgograd was to work with Volgograd counterparts to strengthen the basic system with particular emphasis on activities and measures that will be of immediate and practical benefit, such as visible emissions evaluation. In the United States, visible emissions evaluation is an effective, inexpensive technique to strengthen enforceability since it requires neither access to the enterprise nor costly instrumentation. It relies on the trained eye of the observer to evaluate the opacity of the smoke emerging from a stack.

Public Participation

Another goal of RAMP was to spread knowledge and expertise on RAMP successes and air quality issues in general beyond the relatively small circle of technical experts in government and industry. The sustainability of RAMP would be greatly improved with the growth of public support for environmental goals and improved public participation in environmental issues.

Legal Task Force

The Legal Task Force consisted of Russian and American attorneys who investigated Russian environmental legal issues and made recommendations to RAMP component leaders. The Russian legal structure is very complex and much different than the American system.

The Legal Task Force had a unique position in the RAMP project. In one sense, the task force acted as a RAMP component but it was funded separately for the most part, generally through the Harvard Institute for International Development grant on a related US AID/EPA project. It also did a great deal of work independently of the RAMP project.

Training

One of the major goals of RAMP was to disseminate project results and possible applications throughout the Russian Federation. The most important way of doing this was through the Center for Environmental Training (CET) established in Volgograd. The center was intended to be the main vehicle for spreading the lessons learned in RAMP in Volgograd.

SUMMARY OF IMPORTANT ACTIVITIES

ENGINEERING

- Conduct an emissions inventory for selected key point and area sources in Volgograd.
- Review technology-based emission standards in other countries and the applicability of such an approach in Russia.
- Provide technical guidance on low cost measures.
- Advise Russian planners on strategic options for improving public health-related air pollution problems in Volgograd.
- Conduct source evaluations on nine significant stationary sources.

LEGAL

- Identify legal and regulatory changes needed to implement specific RAMP projects.
- Establish a certification program for inspectors of visible emissions.
- Support implementation of an approved public participation program for regulatory decision-making.
- Develop a plan to legally enable the implementation of the successful elements of the Volgograd pilot to Russia-wide application.

MONITORING

- Install and operate new air monitoring and laboratory equipment provided by the Commodities Import Program (CIP).
- Conduct and report on a summer air quality characterization study.
- Initiate the development of a Pollutant Standards Index (PSI).
- Setup and operate new source emissions testing and associated laboratory CIP equipment.

TECHNICAL INFORMATION

- Initiate an air quality management system based on health standards
- Formalize non-health standards with the formal use of a visible emissions program.
- Adopt standardized emission factors for inventory maintenance.
- Move toward use of non-wet chemistry methods for pollutant identification.
- Accept the concept of non-traditional sources (i.e. fugitive dust) as a significant air pollution problem.

RAMP TOOLS

The Russia Air Management Program's (RAMP) goal was to improve national institutions, policies, and practices for air quality management in Russia. RAMP demonstrated the application of potential air program improvements in the pilot city of Volgograd and worked to facilitate implementation of selected elements of the pilot project in other areas of Russia using training, technology transfer, and public awareness. Although RAMP's goal was the demonstration of air quality management techniques, it also resulted in measurable reductions of health-related pollutants in Volgograd. Because of the implementation of low cost measures there was approximately a 10-12% improvement in air quality.

The demonstration and the evaluation of American air quality management approaches has potentially given Russian environmental officials some new tools in their efforts to improve air quality. These are listed below and discussed further in the component sections which follow.

Low Cost/No Cost Measures

- In-depth source assessments for nine stationary sources were conducted in Volgograd.
- Detailed cost estimate reports were prepared for the Red October Steel Mill, the silica brick materials plant and the Volgograd aluminum plant.
- Enterprises in the "Triangle" area successfully implemented a number of low cost/no cost measures with resulting emission reductions. For example, Volgograd Aluminum is reducing fugitive emissions from plant roads through the use of paving and a regular water spraying program and the silica building materials plant has implemented a new process for the manufacture of wall materials using waste byproducts from the Khimprom plant, a chemical manufacturing facility. Once all recommendations are implemented for these three enterprises, it is estimated that harmful emissions will be reduced by 35%.
- Technical guidance on low cost/no cost measures for several source categories was developed and disseminated to local environmental agencies throughout Russia.
- Precast delta control equipment was developed and tested at the Red October Steel Mill in Volgograd. It is hoped its application to electric arc furnaces in steel mills in other parts of Russia will eventually be routine. The precast delta substitutes for refractory bricks and will reduce energy consumption, fugitive emissions and furnace down-time.

Emissions Inventory and Emissions Factors

- An emissions inventory was developed for key point and area sources in Volgograd.
- Source testing programs in Volgograd and St. Petersburg were coordinated to ensure that data of sufficient quality were collected to generate emission factors from the source testing results.
- Final emission estimates were made and submitted to the RAMP strategy development component to allow for modeling of the air basin in northern Volgograd (the "Triangle").

Emissions Testing

- Formal emission testing procedures and guidance were established. Laboratory methodologies for sampling analysis and data evaluation were improved in conjunction with the acquisition of the US AID Commodities Import Program (CIP) equipment.

- A visible emission program was developed, certified and tested, first in Volgograd and now in other parts of Russia, including a certification program for visible emissions inspectors. This is the first non-health based standard in Russia.

- As part of the CIP program, the Volgograd agency received two smoke generators to be used in training and certification of inspectors.

- The use of technology-based standards in other countries was reviewed and their applicability assessed for use in Russia.

Compliance and Enforcement

- Russian inspectors, enterprise environmental personnel and State Committee personnel have been trained and certified for visible emissions on several occasions, both in Russia and the United States.

- Russian inspectors and enforcement officials have had detailed discussions with their American counterparts on US enforcement requirements and procedures to see what American methods might be transferable to Russia.

Ambient Monitoring

- New air monitoring and laboratory analysis equipment was provided by the CIP. It has been installed and used during the summer saturation study.

- Several small scale saturation studies were conducted to profile PM-10 impacts in Volgograd. These studies helped to train Russian technicians in American methods, identified operational and logistical features and problems associated with these kinds of networks, and provided useful PM-10 data for design of future studies.

- An intensive summer air quality characterization study was conducted in the northern sector of Volgograd, with more limited characterization of impacts in the southern sector. The study generated approximately 500 PM-10 data points, with a subset of 200 submitted for elemental analyses. Together with source production and source test information, these data provided the basis for preliminary source apportionment and context analyses.

- A national air quality trends report for the general public was developed and published by Main Geophysical Observatory in St. Petersburg.

- The development of a pollutant standards index for Russia was initiated.

- New emissions monitoring and related laboratory analysis equipment acquired through the CIP program was installed and put into operation.

Strategy Development

- As other components completed their work, control strategy alternatives for several enterprises in the "Triangle" region of Volgograd were developed. These analyses showed the impacts of both low cost and high cost measures on enterprises in this area, making it possible to develop a multi-source strategy for the area.

Legal Task Force and Legislation

- Legal and regulatory changes needed to implement specific RAMP projects were identified.

- The Legal Task Force developed a plan to legally enable the implementation of the successful elements of the Volgograd pilot for visible emissions to Russia-wide application. In particular, a certification program for visible emissions inspectors was established.

- Several successful elements of RAMP were introduced into draft legislation.

Risk Assessment

- Emission inventory results were combined with meteorological data to make estimates of health risk associated with emissions from various sources. Strategy options, including both low cost and high cost measures, were then analyzed.

Training and Public Participation

- A regional Center for Environmental Training (CET) was established in Volgograd. The CET has developed several original courses, including an air quality management course. The CET has developed a pool of teachers and facilitators who are available to serve the Volgograd region and ensure that the lessons learned from RAMP can be replicated elsewhere in Russia.

- The CET provides courses in air and environmental management for public officials, non-governmental organization (NGOs), enterprises, research and academic institutions, and the general public. Many courses utilize US interactive teaching methodologies while incorporating Russian content, regulations and examples.

- In the short time the CET has operated, it has offered nearly 20 courses to approximately 400 participants. These include US EPA courses adapted to Russian needs as well as newly written courses.

- The Public Participation Task Force and the CET have combined to offer a children's environmental class. This class combines classroom presentations with visits to enterprises and includes the demonstration of a model showing the environmental effects of an enterprise on its surrounding terrain.

- The Public Participation Task Force made a number of small grants for citizen projects, including the cleanup of a natural spring, tree-planting and the compilation of a directory of area environmental organizations.

- An entire issue of a Russian air pollution journal was devoted to the results and highlights of the RAMP project.

Thompson Pace
Project Manager (1993 - 1995)
U.S.EPA

"The program will be implemented through a people-helping-people approach that relies on substantial involvement by both US and Russian policy and technical staff."

PLANNING

BACKGROUND

The initial planning document for the Russia Air Management Program (RAMP) was completed by US EPA's Office of Air Quality Planning and Standards (OAQPS) in collaboration with the Russian Federation under the auspices of the World Bank, with assistance from the US Agency for International Development. The document was completed in May 1993, and became the blueprint for RAMP's implementation. The cooperative effort put forth in creating the planning document paid dividends during the course of the project.

The RAMP was designed to have three objectives: (1) national rapid assessment, (2) the Volgograd pilot program, and (3) the effort to strengthen the federal air quality management capabilities:

Rapid Assessment - The first activity was to evaluate and prioritize 20 Russian cities for future action, based on their emissions, air quality levels, and exposed populations. Some supplemental monitoring equipment was provided to these cities and each was visited by a team of Russian experts. The assessment built upon reports already prepared by Hydromet, the Russian agency responsible for air quality monitoring and modeling. The World Bank requested assessment results for inclusion in their Environmental Action Plan (EAP) for Russia.

Pilot Program - A pilot city was needed to provide a practical demonstration and evaluation of control strategy alternatives. Volgograd represented a reasonable choice and was agreed upon by all participants. The program in Volgograd began with a short-term study to characterize air quality and the sources in the area. Based on the data base, analyses, and policy options that were jointly developed, low cost control measures for major stationary sources were identified (and implemented as resources permitted) and a specific cost-effective 3- to 5-year control strategy for completing the cleanup of the air in the Volgograd region was planned and partially implemented.

Federal Program - Throughout the program in Volgograd, close coordination and involvement was maintained with the Ministry (later called the State Committee) and selected other oblasts so that the information learned and decisions made in Volgograd could be used by the Ministry and other oblasts to determine possible changes to the federal (and oblast) approaches to air quality management. Through training and technology transfer, the appropriate changes could then be implemented Russia-wide. Examples of this include national legislation and national standards, in particular for the visible emissions program.

Volgograd, Russia

ACCOMPLISHMENTS

The tenets of the RAMP are worth revisiting six years later. It is clear that while the planning document charted a course which was altered by intervening events, the basic principles guiding RAMP's design and eventual course remained intact. The planning program was implemented through a people-helping-people approach that relied on substantial involvement from US EPA air policy and technical staff in OAQPS, US EPA Regional Offices, and other US EPA Headquarters offices. There was substantial involvement by Russian technical and policy staff in conducting analyses to support program changes and in developing revisions to Russian guidance, policy, and legislation.

Program managers from US EPA, the Russian Ministry, and the Volgograd Environmental Services Administration (VESA) made up the RAMP management team. The planning document, and ultimately its implementation, consisted of ten or so "components", each of which had a detailed plan in the context of the US air quality management structure. This "plan-within-a-plan" had very specific tasks which were delineated as Russian led, US led, or jointly led, to optimize responsibility and accountability.

DOCUMENTATION

"Russian Air Quality Management Pilot Program," by Thompson G. Pace (US EPA) and Vladimir Rezchekov (Ministry of Environment - Russian Federation), October 30. 1992.

"RAMP Draft Planning Document (English and Russian language versions), US EPA OAQPS, May 1993.

"Air Quality Management in Belarus and the United States," presented by Thompson G. Pace at the Belarus National Environmental Strategy Conference, Minsk, Belarus, September 1993.

"Russia Air Management Program," presented by Svetlana Kosenkova, Stanislav Markin, and Thompson G. Pace at the World Clean Air Conference, 1995.

Principals Involved in Planning Component

Roger Batstone, World Bank
John Irwin, US EPA
Svetlana Kosenkova, VESA
Stanislav Markin, MPENR
Vitaly Milyaev, SRI AAP
Thompson Pace, US EPA
Joseph Paisie, US EPA

Charlene Spells
Source Assessment Component Manager
U.S.EPA

"The concept of incremental levels of air pollution control/emission reduction techniques (from good housekeeping measures to application of control equipment) as used in air quality management in the United States was a tool for the Russians who were used to thinking of air pollution control in terms of technology only."

LOW COST MEASURES

BACKGROUND

The source assessment and the low cost/no cost measures component of RAMP began work in mid-1993. The primary intent of this work was to complete a guidance document for the assessment of enterprises and to recommend low cost control measures which could be implemented quickly that would result in significant reductions in air emissions. In October 1993, nine sources (called enterprises in Russia) were chosen to be evaluated in Volgograd and initial source assessments were conducted. The sources evaluated were chosen based on their contribution to air pollution in Volgograd and their representativeness of industrial sources throughout Russia: cement/concrete production, silica building materials production, primary aluminum production, and secondary steel materials production.

ACCOMPLISHMENTS

Particulate matter was the pollutant of choice due to its overwhelming influence on the environment in Volgograd. Using lessons learned in the United States, US EPA officials completed reports for each of the nine sources in May 1994. Each report identified potential no cost/low cost air pollution control measures that could be implemented expeditiously and would result in both visible and measurable air quality improvements in the Volgograd area.

These reports not only provided essential information for the source assessment component of RAMP, but also served as the basis for the emissions inventory and emissions reduction strategy development components of RAMP.

Detailed cost estimate reports for both low cost and traditional control measures were prepared for the Red October Steel Mill, the silica building materials plant and the aluminum plant. (These sources anchored a small study area in the northern region of Volgograd referred to as the "Triangle"). The reports contained cost estimates for several recommended no cost/low cost control measures and several traditional control measures for each of the sources. Schedules for implementation of selected low cost measures were agreed upon in May 1995. The three enterprises originally selected have since implemented RAMP team recommendations.

The first draft of the low cost measures (LCM) guidance document was completed in September 1995. Following favorable evaluation in Volgograd by VESA and in the Moscow Ministry of Environmental Protection and Natural Resources in December 1995, the decision was made to expand this part of the project to the Federation level. SRI AAP, in St. Petersburg, agreed to disseminate applicable sections of the LCM guidance document to the local environmental agencies throughout Russia for review and comment. The "Low Cost Guidance Manual for Selected Industries in Russia" was approved for incorporation into

Russian regulation on July 4, 1996. Conversion of the manual into a format compatible for incorporation into Russian regulations has been completed.

> ...low cost measures are now an important part of the operating plans of many of the enterprises in Volgograd.
>
> Svetlana Kosenkova
> RAMP Co-Manager

All of the low cost measures have a documented net benefit to air quality and have not exacerbated existing problems in other media. For example, "Volgograd Aluminum" is reducing fugitive emissions from plant roads through the use of paving and a regular water spraying program and the Volgograd Tractor Plant has switched to the use of a phenol free water-based method for tempering tractor parts, begun recycling manganese rich casting slag, and implemented a scrap management program for its electric arc furnaces. Further LCMs have been implemented at the "AO Volgograd Drilling Equipment Plant" and other enterprises in Volgograd. LCMs are now routinely included as a part of the enterprises' environmental passports (operating permits).

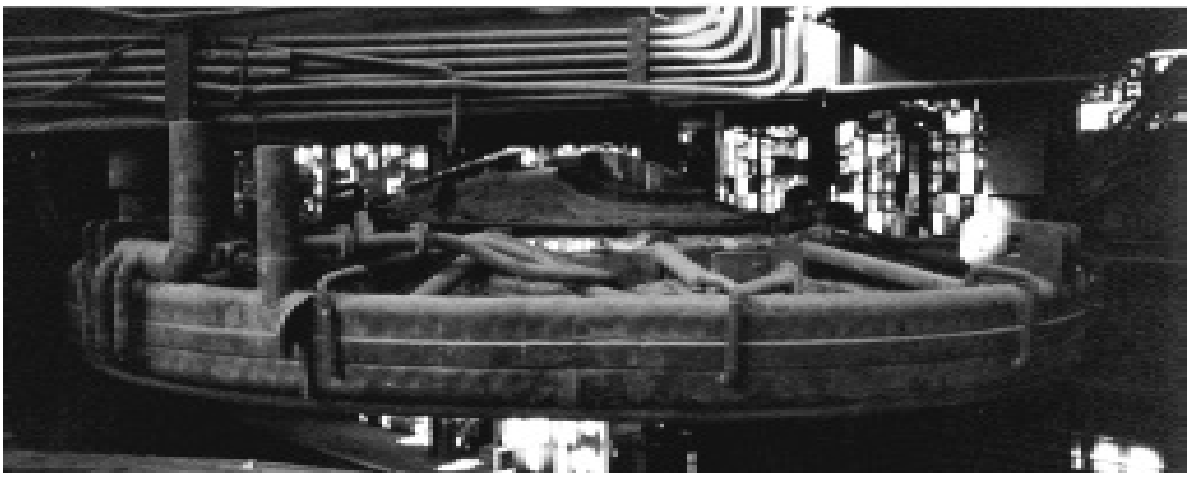
The Red October Steel Mill source assessment report included recommendations for traditional control measures in addition to the no cost/low cost measures. Red October showed significant interest in the application of the precast delta technology for the roofs of their electric arc furnaces (EAFs). A delta is a precast slab with openings for electrodes which can last up to 250 fires of the furnace. It is a substitute for a dome constructed of refractory bricks, currently in use at Red October and throughout Russia, which typically lasts for 20-30 fires. The use of precast deltas would result in a significant reduction in the amount of fugitive emissions released into the atmosphere during the operation of the EAFs.

IMPACT

The source assessments and the implementation of the LCMs resulted in changes to the Russian air quality management system. The guidance manual, "Low Cost Guidance Manual for Selected Industries in Russia," was distributed to affected industries throughout Russia along with a Russian decree requiring its use. Whether or not it is actually being used, or if the decree is being enforced, remains to be determined over the long term. However, the basic goal for the LCM component was targeting categories prevalent throughout the Federation so the adoption of low cost measures could become a common practice. The participation of the SRI AAP in the process was an important "bridge building" step in the overall sustainability of this component, giving the necessary official sanction to these procedures.

Entrance to the Red October Steel Mill, Volgograd Russia

In general, the US approach to air quality issues highlighted a new emphasis for the Russians, who tend to think in terms of examining interactive effects versus discrete elements. Instead of trying to fix the whole enterprise in a single pass, the Russians have now focused their efforts in phases and then apply a simple methodology to identify control options.



Top of electric arc furnace at the Red October Steel Mill to be replaced by a precast delta

DOCUMENTATION

Volgograd Source Assessments and Emission Inventory Reports for:

Silica Building Materials	Red October Steel Mill
Aluminum Plant	Furniture Factory
Oil Refinery	Caustic Plant
Casting and Mechanical Plant (cement/concrete)	Engine Works Plant

Integrated Works of Industrial Structures Plant (secondary steel manufacturing)

"Low Cost Measures Report on Emission Reductions and Cost Analysis for Silica Building Materials Plant, Red October Steel Mill and Volgograd Aluminum Plant"

"Traditional Measures Report on Emission Reductions and Cost Analysis for Silica Building Materials Plant, Red October Steel Mill and Volgograd Aluminum Plant"

Inside of an electric arc furnace at the Red October Steel Mill, Volgograd, Russia

"Low Cost Guidance Manual for Selected Industries in Russia"

1. Hot Mix Asphalt
2. Cement Concrete Industry
3. Silica Brick
4. Primary Aluminum Production
5. Secondary Steel Manufacturing
6. Volatile Organic Compounds

Principals Involved in LCM Component

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Tatiana Koneva, Red October
Oleg Kreitchi, VESA
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Thompson Pace, US EPA
Mark Saeger, SAIC
Charlene Spells, US EPA
Anna Trashilova, IA
Yuri Voronkov, VESA
Ed Wojciechowski, US EPA

Willis Beal
Project Manager, 1995 - 1999
U.S.EPA

...introducing American low cost measures never before used in Russia is a real tribute to RAMP; the furtherance of precast as an accepted LCM in Russia will be both a challenge and opportunity.

LCM CASE STUDY: Precast Delta Technology

BACKGROUND

During site visits to the Red October Steel Mill in October 1993-94, the 125 ton electric arc furnace (EAF) was identified as a significant source of emissions. Emissions were escaping through the electrode porthole during the melting process and then through the electric arc furnace shop roof vents, directly to ambient air. The quantity of emissions was related to the quality of the scrap that was being charged and the size of the electrode holes on the furnace rooftop. When these electrodes vibrated excessively, they would bump into the refractory brick on the roof, chipping away at it and further enlarging the holes. The bigger the hole, the greater the fugitive emissions that escaped uncontrolled through the roof vents.

Under the RAMP low cost measures component, an extensive investigation of appropriate control alternatives resulted in the recommendation of precast delta technology. This precast material is castable so it is all in one piece, rather than made brick by brick. The key was to determine whether precast technology would be applicable to the Red October electric arc furnace(s).

In March 1996, twenty-three Russian members of the RAMP team visited Research Triangle Park, North Carolina, as part of a week-long training and strategy conference. One of the participants was the technical director of Red October Steel in Volgograd. A meeting was arranged in Pittsburgh, Pennsylvania, with the technical contact at AP Green (AMTEC), the American manufacturer of precast deltas, to discuss the precast delta and its applicability to the Red October Steel Mill. While in Pittsburgh, they visited Republic Steel and observed installed precast deltas, and then traveled to Middletown, Ohio, to observe the actual fabrication.

Arrangements were made for the technical manager of Red October to return to the US and meet with AP Green to design a delta for a 125 ton furnace located in the Red October Steel Mill. Upon completion of these blueprints, a mold was fabricated and the precast delta was manufactured in Pittsburgh and shipped to Russia. This effort was intended to be very simple: ship the delta to Russia, transport it from St. Petersburg to Volgograd, and have US experts travel to Volgograd and assist the Russians with the installation of the precast delta. Unfortunately, problems with customs delayed the process for nearly eighteen months.

INSTALLATION

The RAMP team traveled to Volgograd for the installation of the delta in March 1999. The team removed the delta from its mold and centered it on a water-cooled ring that had previously been pressurized and placed on the extreme outside diameter of a brick mound.

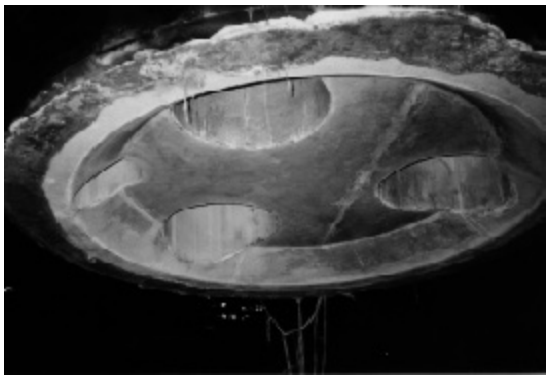
The delta and the water-cooled ring were marked and separated. The ring was then removed from the brick mound and placed on a flat section of the floor. The delta was put inside the water-cooled ring and the two marks aligned. The Russian factory workers then went around the circumference of the delta with a rope to even up the spaces between the delta and the ring and to center it.

The next step was to physically make the field pour for filling the space between the delta and the water-cooled ring. Once the pour was completed, the delta was covered entirely with an asbestos blanket. The following day, the asbestos blanket was removed in order to insert a gas pipe underneath the delta. The entire unit was then covered with the asbestos blanket. After determining that water was not escaping, the delta was aligned onto the electric furnace.

U.S. fabricated delta in casting mold at the Red October Steel Mill.

The delta is removed from the casting mold.

Water-cooled ring prepared for delta installation.



Delta is positioned in the water-cooled ring after pouring of thermal-resistant concrete between the delta and the ring.

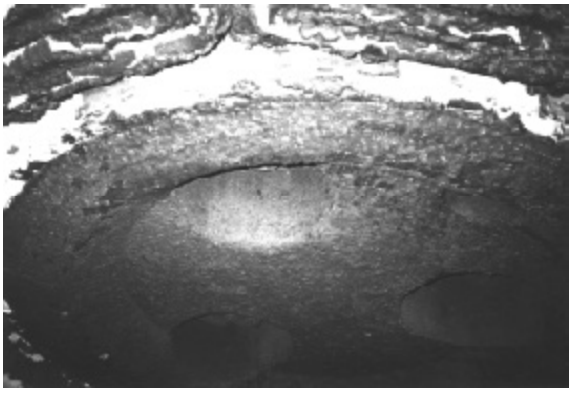
RESULTS

The installation of the precast delta was successful. The visible emissions, which were approximately 30-40% with the old roof design, were reduced to zero. This fact alone is evidence that the application of this low cost measure was effective. With the visible emissions reduced to zero, most of the emissions are being evacuated through the fourth hole and ducted to the control cleaning device, two sets of Venturi scrubbers in series. It was noted upon leaving the EAF shop that the emissions through the stack appear

Delta and ring are ready for installation on the EAF.

Delta has been installed on the EAF. Compressed rings are visible. Electrodes go through compression rings.

to have increased. Initially this may seem like a disadvantage, but actually it is a positive benefit to the environment. It verified that more of the emissions from the electric arc furnace are making their way to the control device, which would later be calibrated to handle their increased level.



Delta after the first heat. Deposition of metal oxides is visible on the lower surface.

IMPACT

From a qualitative standpoint, the installation of the precast delta on the electric arc furnace has been significant. A preliminary indication to support that success was the visible emissions in the shop from the EAFs were immediately eliminated and the visible emissions out of the stack had increased. The delta minimized the space around the electrode holes, so that more of the emissions were captured and drawn off through the fourth hole and directed to the air pollution control device. In the past, the emissions were able to escape through unusually large electrode holes, bypassing the control device altogether and escaping to the atmosphere through the vents in the electric arc furnace shop.

The Russians adopted US methods of measuring the furnace emissions before and after installation of the delta. There are three phases of testing, the melting period, the oxidation period, and the reduction period. The testing with the old roof during the melting period for particulate matter resulted in a mass emission rate of 20 grams/second. After the installation of the delta, the melting period yielded emissions at 109 grams/second. There are no visible fugitive emissions; however, it appears there are five times the organized emissions, which can be captured by traditional control measures.

The important initial result is that the fugitive emissions after the installation of the delta were not visible. Once the operation of the system has been optimized and the conditions stabilized, the Russian operators and technicians will be able to get a better "after delta average," and from there make better comparisons and draw stronger conclusions.

Although the Volgograd specialists are still completing that study, it appears clear that the precast delta is a viable strategy for Russian EAFs — reducing emissions, conserving energy and increasing operating time. The Russian partners plan to take the results of this test and move toward disseminating the technology throughout Russia. The success of the precast delta technology is one of the major achievements of the RAMP project.

Principals Involved in Precast Delta Component

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S. Rogov, Red October
A. Rybkin, Red October
Lee Whaley, REFCO
Alex Wilkie, Harbison-Walker

James Southerland
Component Leader, Emissions Inventory
U.S.EPA

"A proper emissions inventory is integral to the strategy development for the Volgograd triangle area."

EMISSIONS INVENTORY

BACKGROUND

The goals of the emission inventory component of RAMP were to transfer US emission inventory technology and experience to Russian counterparts to support an improvement of current Russian emission factors and inventories. Additionally, this component of RAMP was designed to work with other RAMP components such as source testing, strategy development, and ambient monitoring. Emission inventory activities included development and implementation of an area and point source inventory in Volgograd, coordination of source testing programs in Volgograd and St. Petersburg, collection of data to generate emission factors from the source testing results, and preparation and submittal of emission estimates to the RAMP strategy development component to allow for modeling of the air basin in northern Volgograd.

ACCOMPLISHMENTS

Russian and American emission factors and inventory development practices were studied by the RAMP team in 1995. The results of this evaluation indicated significant differences between US methods and Russian methods. Recommendations were made to evaluate Russian methods in greater detail and to proceed with the full initiation of the Volgograd pilot inventory for point and area sources. Data from the February 1994 US EPA survey were compiled and used along with other information to determine which source categories were to be inventoried in Volgograd and which sources should be included in the task to improve Russian inventory guidance. US EPA guidance and software were provided to the Ministry, VESA, SRI-AAP and Institute Agroproject (IA) along with an English/ Russian-Russian/English glossary of inventory terms in the spring of 1994. US EPA visited Volgograd in June 1995 to demonstrate to IA and VESA staff members how to calculate emissions based on the area source inventory plan and how to store the collected data in computer spreadsheets. The designated Volgograd area sources included waste water treatment facilities, chemical storage tanks, residential heating and on-road vehicles, among others. The Volgograd area source inventory was edited and was conducted in the summer of 1996.

POINT SOURCE ACTIVITIES

In March 1995, the US EPA, VESA, and Institute Agroproject defined a limited geographic region of Volgograd where the point source inventory would be concentrated. This region, termed the "Triangle", was formed by the Red October Steel Mill, the silica brick materials plant, and the Volgograd aluminum plant and included the batch cement plants, furniture manufacturing, bakeries, large residential boilers, and dry cleaners. Emission estimates for the point source inventory were submitted in late 1996.

IMPACT

"The upgrade of inventory factors, methodology and training will pay benefits to the Russian environment for many years."

Vitali Milyaev
Director, SRIAAP

The US EPA, the Ministry, Volgograd Environmental Services Administration (VESA), Hydromet, and Institute Agroproject all collaborated on the emissions inventory component. This led to the development of a pilot point, area and mobile source inventory in Volgograd. The lessons learned from implementing the pilot study helped support improvements to the Russian national emissions inventory guidance. Source testing activities in Volgograd helped to validate control efficiencies and emission factors used in the emissions inventory. Ambient testing and associated laboratory support helped in assessing the contributions of individual facilities to the overall air quality in Volgograd. Subsequent to this RAMP activity, the Ministry and VESA developed an emissions factors document for bakeries — a direct "lesson learned" from RAMP.

DOCUMENTATION

"Emission Estimating Method and Plan for Volgograd Pilot Area Sources, 2 February 1995."

"Emissions Estimating Methods and Plans for Volgograd Pilot Area Sources - Final Inventory Results, 1996."

"Emission Estimating Plan for Volgograd Pilot Point Sources, 15 July 1995."

"Emission Estimating Methods and Plan for Volgograd Pilot Point Sources - Final Inventory Results, 1 Sept. 1996."

"Report on the Appropriateness of US Area Source Guidance for Use in Russia, 26 July 1996."

"Report on the Appropriateness of US Point Source Guidance for Use in Russia, 15 July 1996."

"A Comparison of Russian and US Emission Estimates, 4 September 1996."

"Test Results for Red October and Primary Aluminum Plant using Russian Testing Equipment, 3 September 1996.

"Saturation Monitoring Project Operation and Maintenance and Quality Assurance Manual, 30 September 1996."

Principals Involved in Emissions Inventory

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Larisa Vishnevetskaya, IA
Elena Zimina, VESA

Anthony Wayne
Component Leader, Emissions Testing
U.S.EPA

"....the demonstration and use of the visible emission technique was one of the most successful RAMP achievements, one that should have lasting results."

EMISSIONS TESTING

BACKGROUND

The main goal of the stack emission testing effort was to provide a technical base for a Russian program of visible emissions inspections. Additionally, there was a joint US EPA/Russian assessment and comparison of testing methodologies used for emissions testing in the two countries. The testing also provided a quality check on emission factors used in the emission inventory component. In May 1994, an agreement between US EPA and the Volgograd Environmental Services Administration (VESA) defined the direction of a Volgograd and Russia-wide visible emission program and identified both technical and legal requirements for program implementation.

ACCOMPLISHMENTS

The program has resulted in the training of Russian inspectors, enterprise environmental personnel, and Ministry officials in visible emission observations. In May 1994, the first smoke school demonstration was performed in Volgograd at which thirteen Russians from industry and regulatory agencies were trained as future instructors on visible emissions inspection techniques. In January 1995, six additional Russians were trained to monitor visible emissions.

The stack testing effort has been coordinated with the visible emission program (see the section below on Inspections) to assess both the emissions from enterprises prior to control and to assist Russian interest in linking visible observations with mass emissions. The testing upgraded existing Russian methods and served as a bridge between Russian and US EPA methods so that qualitative and quantitative comparisons of results from the two methods could be attempted. This allowed for a more informal understanding of Russian data by the US and other international organizations and efforts. The testing introduction was initiated parallel to the visible emission effort. The testing has been tied to ambient monitoring and was a complementary component of the ambient summer study conducted in the summer of 1997.

CIP Mobile Laboratory

IMPACT

The highlight of this effort has been a visible emission program in which an entirely new non-health-based program of emission standards applied to sources and inspector evaluations was used routinely as a part of the Russian source permit program. The success of the program has been recognized and will continue to expand elsewhere in the Russian Federation.

"The utilization of Method 9 (visible opacity) procedures will significantly intensify the studies and the identification of air quality violations."

Oleg Kreitchi
Cheif Engineer, VESA
Volgograd, Russia

Highlights from the RAMP component of emissions testing are as follows:

- Established formal emission testing planning procedures and guidance.
- Coordinated and delivered methods, quality assurance manuals and specific equipment and training to VESA.
- Evaluated and assisted in establishing an initial and continuing program of emission measurement and monitoring training for other Russian ministries based upon Volgograd pilot city activity.
- Specific training and syllabi through the Commodities Import Program (CIP) and the US EPA's Air Pollution Training Institute video and training manuals.
- Assisted and advised in evaluating and recommending laboratory upgrades for sampling analyses and data evaluations including (1) automated data acquisition system capabilities assessments, (2) mobile lab assessments, and (3) equipment safety and training assessments.
- Advised and assisted in establishing an initial and continuing program of inspector emission measurement and monitoring training.

Oleg Kreitchi, VESA, at the site commemorating the first certified Russian smoke school.

DOCUMENTATION

Kreitchi, Oleg and Anthony Wayne, "Establishing a Viable Visible Emissions Program - Volgograd," Volgograd Environmental Committee Inspectorate/US EPA/OAQPS, June 7, 1996.

Kreitchi, Oleg, Stanislav Markin and Anthony Wayne, "Volgograd Visible Emissions Implementation Plan - Volgograd," *Russian Ministry Report*, The Volgograd VE Experiment, VESA/Ministry/US EPA, January 1997.

Principals Involved in Source Testing/Visible Emissions

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Andre Nedri, SRI AAP
Sergei Timakov, SRI AAP
Anthony Wayne, US EPA

Ron Rutherford
Component Leader, Compliance & Inspection
U.S.EPA

"If the Russians are not successful in getting more flexibility in the law with regard to how enforceable evidence is collected . . . then this tool will have limited, though still valuable, use . . ."

COMPLIANCE & INSPECTION

BACKGROUND

The primary goal of the compliance and inspection component was to strengthen compliance determination methods for Russian inspectors. Technical and legal support was given to help Russian agencies to evaluate, pilot, and establish visible emission evaluations and incorporate them within Russian enterprises' ecological passports (the equivalent of American operating permits). Additional goals included strengthening Volgograd's air program enforcement by providing support for improvements in the existing emission fee system and strengthening Volgograd's inspections program with the goal of extending improvements to the Russian Federation. These efforts were aided by the work of the Legal Task Force which found authorities in Russian law for using opacity as a compliance indicator. During December 1995, RAMP representatives met with SRI-AAP and Gostandard (the office certifying official methodologies) in St. Petersburg to agree on a contract and a schedule for Method 9 (visible emissions evaluation) certification. Russian acceptance of Method 9 (opacity or visible emissions regulation) for a one year trial period was obtained in May 1996. This approval was later extended for an indefinite time.

ACCOMPLISHMENTS

The introduction of the concept of visible emissions observations and opacity as an enforceable standard was accomplished to give Russian inspectors, as well as enterprise operators, an easy and inexpensive means to evaluate if and how well processes and emissions control devices are being operated and maintained to minimize emissions of particulates. This has been a very successful tool in the US and has been recognized by the Russians as a valuable new compliance tool. This has been a joint effort of the Compliance and Inspection, Emissions Testing and Legal Task Force components of RAMP and has resulted in the establishment of a visible emissions observer training program complete with a train-the-trainer course and smoke generators, a certification by the Russian Federation of a Russian version of US EPA Method 9, an experimental project in Volgograd to demonstrate the efficacy of visible emissions observations and their use setting opacity standards for enterprises, and the support in Russian law to use opacity as a compliance method.

OBSERVATIONS

The Inspection and Permits Program of VESA was first evaluated in September 1994, when the high level of inspector expertise and the sophistication and completeness of the ecological passport (permits) program was noted. Russian Federation ecological

(environmental) laws were found to be substantial and multimedia in nature. Regarding air regulation, all sources of air emissions are regulated at the enterprise level and addressed in the passport, including mobile source emissions. Inspectors are well-trained engineers knowledgeable in the processes of the enterprises to which they are assigned, often being former employees of these enterprises.

"The introduction and demonstration of opacity as a new standard in ecological passports have moved the efficacy of an inspection program to new heights."

Oleg Kreitchi
Head Inspector, VESA
Volgograd, Russia

However, offsetting the thoroughness of the passports and the technical expertise of the inspectors are the often unrealistic limits placed on emissions and the "non arms-length" relationship of the inspectors with the enterprises' management. This gave rise to the paradox of apparently strong ecological laws, emission limits and qualified inspectors, but still having obvious air pollution. At most enterprises it was observed that the implementation of consistent operation and maintenance procedures on existing controls or with work practices and housekeeping activities could significantly reduce current emissions.

Regarding enforcement program evaluation, it was apparent that the system of fining enterprises established in Russian ecological law was clearly ineffective due in part to devaluation of the ruble. Current Russian law establishes a "fee to pollute" scheme whereby enterprises pay a rate for each ton of pollutant emitted, which is increased when allowed levels are exceeded and increased based on exceeding specific time periods. The cost of pollution controls compounded with the devaluation of the ruble made most fees negligible; it is currently much less expensive for enterprise management to pay these fees than expend the resources to comply.

A serious problem observed is that third-party verification is required of any violations that an inspector may find and attempt to enforce. Though this has its roots in Russia's past, it should be addressed if there is to be an effective future Russian enforcement program. There are some strong cultural issues that must be confronted and resolved if enforcement of Russian environmental laws is to be effective. The US/ Russia Environmental Legal Task Force has been addressing this problem and seeking ways to remedy such restrictions on enforcement.

Russian presented "smoke school".

IMPACTS

If the interest continues that the Russians have shown to date in the concept of opacity as an enforceable standard, separate and distinct from the other pollutants, and of the use of visible emissions observations as an effective low cost inspection tool, then these activities will have a lasting influence. On the other hand, if the Russians are not successful in getting more flexibility in the law with regard to collecting enforceable evidence (i.e., the third party verification issue) then this tool will have limited, though still valuable, use. Currently, Russian law allows the use of opacity as an indirect indicator of a violation of underlying

mass emissions standards, by indicating poor operation of control equipment, proper operation of which is required in Russian law. So, even if opacity per se is never legislated to be enforceable by itself, inspectors, and even enterprise operators, can use it to indicate problems with process or control equipment operations and take any necessary corrective measures to minimize emissions and order stack tests.

As for the issues raised with the relationship of inspectors to enterprise management and with the current "pay to pollute" fee system of "fines", only time will tell. However, the concept of fees for pollution versus fines has cultural elements that will not easily change. It will take some time for the differences in these two approaches to enforcement to be implemented by the Russians.

The RAMP experiences demonstrated clearly the value and need for a consistent, strong, timely and fair enforcement program if environmental laws are to be effective and not just words. While Russian environmental laws are impressive, covering a broad range of pollutants and imposing very restrictive health-based emissions limits, they have not been effective in improving the quality of the environment.

Principals in Compliance and Inspection

Vladimir Bokatov, VESA
Vladimir Glybin, VESA
Oleg Kreitchi, VESA
Ron Rutherford, U.S.EPA

Jon Schweiss
Ambient Monitoring Component Leader
U.S.EPA

"There are few places where saturation sampling is both more needed and better-suited than Russia."

BACKGROUND

Fully understanding the character of air quality problems over time and space is absolutely fundamental to conducting an effective and efficient air quality management program. This understanding is best achieved through the careful integration of monitoring, modeling, and source engineering disciplines and activities. Toward this end, one of RAMP's original priorities was to familiarize the Russian partners with special US air monitoring techniques involving saturation sampling and source apportionment.

Involving no truly continuous or automated methods, Russian air monitoring systems are exceedingly labor-intensive and often do not offer compelling detection sensitivities. Given the lack of resources to procure newer technologies, the literally hundreds of ambient standards for which the Russians are responsible, and the enormous scope and complexity of the problems they face, the Russians have done a remarkable job of developing and maintaining permanent air monitoring networks throughout the Federation. Unfortunately, the basic representativeness and utility of these networks are largely unknown.

Saturation sampling and source apportionment techniques developed in the US can effectively address these uncertainties, leading to improved network design and more informed emissions control strategies. Saturation sampling provides a rigorous profile of air quality impacts throughout an area of interest through the deployment of a large number of portable, low cost samplers for a relatively short period. Source apportionment is a technique which identifies the relative contribution made by individual sources or source types to total pollutant impacts using chemical fingerprints unique to those sources or source types. And because they mark something of a middle ground between low-tech and high-tech approaches, these techniques are well-suited for application to the Russian circumstance. An intensive air characterization study in Volgograd was conceived by RAMP to introduce these and related techniques to the Russian contingent in 1994 for possible subsequent application throughout the Federation.

ACTIVITIES

This work was heavily dependent on the timely procurement and delivery of monitoring and analytical equipment under US AID's Commodity Import Program (CIP). Successive delays encountered in the CIP procurement process necessitated three re-schedulings of the Intensive Study, from 1994 to 1997. A total of three mini-saturation studies were conducted in the intervening years with US EPA equipment to develop on-site familiarity and proficiency with some techniques to inform the design of the larger study and to develop some empirical data against which the efficacy of dispersion modeling analyses

could be reconciled. A number of other collateral projects (e.g., Russian-US inter-method comparisons) were conceived but unrealized.

A scaled-down version of the intensive study began in the summer of 1997. Comprised of contemporary ambient sampling, source testing, and source production tracking functions, the original scope of the study was reduced by an estimated 70% due to prevailing time and resource constraints.

"Our experience has demonstrated the utility of saturation sampling - now to the business of finding a permanent 'home' for it in Russia."

Liudmila Kurdina
RosHydromet
Volgograd, Russia

ACCOMPLISHMENTS

The first mini-saturation study in Volgograd was conducted in Fall 1994, yielding a Russian contingent trained in the design and operation of a 10-site network of samplers (sited throughout the Triangle), identification and resolution of several operational and logistical problems associated with these types of studies, and some useful PM-10 data from which to design subsequent studies. A brief report on this study was prepared in 1995, including the evaluation of some 200 ambient PM-10 samples.

The second and third mini-saturation studies built on the experience of the first study and were designed to profile bi-seasonal PM-10 impacts in Volgograd. Conducted in Fall 1995 and Winter 1996, these new studies improved operational proficiencies and yielded mass PM-10 concentrations and some chemical information for use in revising the emphasis on emissions inventory development (e.g., considering area sources) and model reconciliations. Approximately 400 PM-10 data points were generated in these studies, together with contemporary meteorological and source production information. A draft report of the Fall 1995 study and a preliminary work-up of the Winter 1996 study results were prepared.

Installation of air quality monitor near Red October Steel Mill.

The 1997 intensive study emphasized profiling PM-10 impacts in the North sector of Volgograd, with more limited characterizations of impacts in the South sector. Some 500 PM-10 data points were generated by this study, with a subset of 200 samples submitted for elemental analyses. These data, together with source production and source test information, will provide the basis for preliminary source apportionment and other contextual analyses.

IMPACTS

The impacts of this work have been both direct and subtle in character. The Russians are now familiar with and proficient in the conceptual and applied aspects of the work undertaken through this component. In addition to generating volumes of new information on Volgograd-

specific air quality impacts, the Russians clearly see and appreciate the practical virtues of exploiting these low cost/data-rich techniques in their current circumstance. And importantly, they are also devoting serious thought to developing a Russian PM-10 ambient standard and may reconsider their conceptual approach to non-attainment areas.

These efforts have also produced a far more subtle, but no less profound effect. Armed with new and accessible techniques, the Russians are now more prepared to confront thorny technical issues from a positive, can-do perspective. If one of RAMP's primary objectives was in assisting the Russians in their search for solutions to what previously were seemingly insoluble problems, then some real measure of success has been achieved.

Resource questions and the fact that several organizations in the Russian Federation, both at the federal and local levels, deal with monitoring issues makes it difficult to predict the future success of this component with any assuring confidence. Issues related to the availability of the CIP-procured equipment to replicate special monitoring initiatives elsewhere throughout the Russian Federation are far from settled. But, the RAMP experience has proven that the innovative air characterization techniques tried under RAMP both work and have wide utility in Russia, so despite these reservations, RAMP participants continue to be optimistic about the future use of these techniques in Russia.

DOCUMENTATION

"Report on the Fall 1994 Volgograd Saturation Study"

"Draft Report on the Fall 1995 Volgograd Saturation Study"

"Preliminary Draft Report on the Winter 1996 Volgograd Saturation Study"

"1997 Volgograd Saturation Monitoring Program: Quality Assurance/Operation and Maintenance Plan"

Principals Involved in the Ambient Monitoring Component

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Jon Schweiss, US EPA
Robert Stevens, US EPA
Yuri Tsaturov, RosHydromet
Larisa Vishnevetskaya, IA

STRATEGY DEVELOPMENT

Marius Gedgaudas
Component Leader, Strategy Development
U.S.EPA

"It is my hope that another development stemming from the strategy development will be the creation of a steering committee that will be responsible for bringing the Volgograd experience to the rest of Russia."

BACKGROUND

The overall goal of the strategy development component was to craft recommendations and implementation schedules for cost effective control measures leading to the most significant reductions in air pollution in the Volgograd area. The strategy was confined to an area of approximately 22km^2 in Volgograd, termed the "Triangle" - an area bordered by three large particulate matter sources: Red October Steel Mill, the silica brick and the aluminum reduction plant. The coordination among a myriad of different components and Russian/US organizations was critical to this effort. As an example, the emission inventory, compliance monitoring, low cost measures and ambient air monitoring components all funneled into the strategy development effort. Participants from VESA, IA, SRI AAP, and the Main Geophysical Observatory (MGO) all had important roles in the development of an overall strategy.

ACCOMPLISHMENTS

The strategy development component became more active as other RAMP components completed their work and results became available. The strategy component was then ready to identify control strategies for sources that were the major contributors to air pollution through examination of the completed emission inventory and the saturation monitoring studies. At the March 1996 workshop held in the US, it was decided that the results from the emission inventory and ambient air monitoring studies would be used in conjunction with the Russian dispersion model developed by Institute Agroproject to predict the effect of low cost measures and higher cost control strategies on ambient air pollution levels in the Triangle. Furthermore, short-term and long-term strategies would be selected and prioritized and the costs associated with the respective strategies estimated. The work of the strategy development component culminated in a final report with recommendations and implementation schedules in September 1996. The most significant findings of the report were:

- Virtually all of the northern Triangle area exceeds the maximum permissible concentration (MPC) for particulate matter. Most of the areas around the three enterprises exceed the MPC by a factor of five or more (based on the 1994 emission inventory data).

- Low cost measures reduced particulate matter levels dramatically near the silica brick plant, but had minor impacts near Red October and the aluminum plant.

- High cost measures (reconstruction of the entire facilities) are necessary to eliminate most exceedances of the MPC around Red October and the aluminum plant.

"The efficacy of the strategy will prove even more effective when the results from the monitoring studies and source attribution can be factored in . . ."

Larisa Vishnevetskaya
Chief Engineer, IA
Volgograd, Russia

- Model results for PM-10 show no exceedances at the silica brick factory, far fewer exceedances at Red October, and virtually the same results as total particulate matter at the aluminum plant.

IMPACTS

The strategy development component integrated many of the other components in order to quantify the impact and cost of control strategies and to make future decisions more effectively. Further, the Russian technical staff now know how to integrate most of the tools that were provided, especially low cost measures and short-term modeling. Whether they utilize them will probably depend more on politics and finances, rather than technical capabilities. Delays in delivery of sampling equipment from the Commodities Import Program (CIP) did not allow for the coordinated study that was originally anticipated.

DOCUMENTATION

"The Atmospheric Contamination Dispersion Model (Northern Triangle of Volgograd)," Institute Agroproject, Larisa Vishnevetskaya, September 1996.

Principals Involved in Strategy Development

Sergei Chicherin, MGO
Marius Gedgaudas, US EPA
Thompson Pace, US EPA
Jon Schweiss, US EPA
Anna Trashilova, IA
Larisa Vishnevetskaya, IA

LEGAL TASK FORCE

Laura Neuwirth
Legal Component Leader
U.S.EPA Office of General Counsel

"...identifying and resolving legal issues openly promotes a more democratic process as well as better understanding of the project."

BACKGROUND

The goal of the Legal Task Force was to assure that the RAMP project was conducted in a manner consistent with Russian legal requirements and to assist in the institutionalization of RAMP successes. To accomplish these goals, the Legal Task Force did three things: (1) developed a lawyer/client relationship with the RAMP project; (2) identified, researched and addressed legal issues related to the implementation and enforcement of the RAMP objectives; and (3) researched and drafted legal documents necessary to the implementation of opacity readings in Russian practice and the broader institutionalization of these methods in Volgograd and the Russian Federation.

The Legal Task Force was formed following visits to Russia by legal teams from the US EPA, starting in February 1993. In these visits, US EPA identified counterparts and established the framework of cooperation that led to the development of the Task Force. The first formal meeting of the Legal Task Force was held in February 1995. The Legal Task Force was initially implemented with the cooperation of the Center for International Environmental Law (CIEL) which received funds from US EPA for task force management. Air was only one of several environmental issues considered by the Legal Task Force.

ACCOMPLISHMENTS

The Legal Task Force included an ensemble of law experts from a wide range of Russian and American interest groups, including the government, non-governmental organizations, and the private sector. The Task Force addressed several legal issues related to RAMP, drafted the legal documents necessary to incorporate RAMP activities into Russian law, and supported efforts to increase public participation in Russia's environmental policy formulation process.

The Task Force's activities were critical for incorporating the Method 9 approach to opacity readings (visible emissions) into the Russian compliance and enforcement system. The first formal meeting of the Task Force was held in February 1995 when its participants established an air subcommittee to focus on certification of Method 9, developing opacity standards, and related issues. The Task Force recognized that an appropriate legal basis would be the foundation for visible emission certification in Volgograd, as well as throughout Russia.

The impact of the Legal Task Force's activities extended beyond Volgograd by addressing issues that affect Russia's federal enforcement and compliance system. In a February 1996 Task Force meeting, the participants addressed the need for a federal

decree ordering the Volgograd City Environmental Committee to establish opacity limits and mechanisms to ensure the adoption of the federal decree. A federal draft order was reviewed by the Legal Task Force and was presented to the Environment Ministry. By submitting the order, the Legal Task Force openly played a key role in the State Committee's issuance of a decree approving the experimental use of Method 9 throughout Russia in June 1997.

"Our systems are entirely different and thus our priorities are often in conflict."

Vladimir Kostov
Russian Legal Consultant
U.S.AID

Apart from the need for federal authorization, the Volgograd City Administration needed to adopt a local ordinance providing for the establishment of opacity limits by the VESA. A local ordinance would authorize the VESA to include opacity specifications and limits in the documents necessary to operate an enterprise. The Legal Task Force prepared two drafts of a local ordinance and submitted these drafts for adoption by the appropriate local authority. Once the federal order was signed authorizing the implementation of the experimental use of opacity standards, the local order was adopted.

OBSERVATIONS

While the creation of interaction between lawyers and technical experts and written documentation enabled the provision of legal support in a transparent manner, the lessons learned in this project should be examined to encourage more successful approaches in any subsequent efforts.

From the outset of the project, there was an awareness of the deeply embedded view in Russian society that laws did not play an important role in environmental protection. While it is difficult to identify the exact source of this perspective, it is tied to the fact that lawyers are often removed from practical implementation and therefore the laws they draft reflect a more abstract ideal rather than a realistic goal. While the use of an attorney-client relationship in this project was aimed at addressing this issue, the view that laws were not important seemed to prevail in the minds of some Russian officials. This view seemed to relate both to the need for legal authorization for the project as well as the usefulness of realistic laws to encourage compliance. As a result, it was difficult for the legal component to reach goals that seemed relatively administrative and procedural, such as obtaining the attention of officials to ensure signature on key documents, such as the federal decree. As importantly, suggestions regarding public participation and enforcement/compliance mechanisms were never considered seriously by key Russian officials.

These institutional perspectives need to be addressed more directly in the future. In particular, a closer nexus between the legal and technical issues should be applied at the outset of any project. The legal issues need to be presented as an integral part of the project, rather than as an added component, to demonstrate their interdependence in terms of achieving effective compliance. In RAMP, such a close nexus was not achieved until midway through the project. This timing may have contributed to the view by the Russian partners that the legal issues were of lesser significance. Legal issues are likely to be more fully addressed to the benefit of the demonstration project if they are viewed as a critical ingredient of the project from the outset.

Ensuring the involvement of appropriate, actively involved individuals also requires identifying whether all appropriate levels of government have been involved from the outset. In the case of RAMP, legal advice from the Russian Task Force members indicated that the oblast level should have been involved. Unfortunately, the matter came to the notice of the Task Force rather late in the life of the project, after

decisions had been made about whom to involve and at what level. The Russian members of the Legal Task Force suggested that support from oblast officials would be helpful to obtain a Federal decree authorizing the project. For a variety of reasons, however, such officials were never actively involved in the project. While it is unclear whether or not this impacted the project itself, in the future, individuals at all relevant levels of government should be involved from the outset.

DOCUMENTATION

"Federal Decree for Opacity Reading in the Russian Federation."

Principals in the Legal Component

Ruth Bell, US EPA/Office of General Counsel (OGC)
Deborah Dalton, US EPA/OGC
Vladimir Kostov, US AID
Laura Neuwirth, US EPA/OGC
Rich Ossias, US EPA/OGC
Ron Rutherford, US EPA, Denver, CO
Claudia Saladin, CIEL
Robert Teets, CIEL

Dianne Byrne
Component Leader, Risk/Health
U.S.EPA

"Health issues are keys to air quality management and the risk study of Volgograd is an important step. Follow-up on the issue will be critical to the sustainability of RAMP."

RISK/HEALTH

BACKGROUND

The risk assessment portion of the RAMP was intended to estimate the health impact of emissions from Volgograd enterprises on the local population. Risk assessments rely on air quality data obtained either by measurements (i.e., monitoring data) or by estimates that are developed by applying dispersion models to emissions data. Air quality data are combined with health effect information, population census data, and exposure assumptions to project the likelihood of particular health effects occurring among the population living near emission sources. This component of RAMP was designed to build upon the results of other efforts such as source testing and emissions inventory (for emissions data), ambient monitoring, and strategy development.

A baseline risk assessment was planned for Volgograd to estimate the status quo health impacts (i.e., before the application of strategies such as low cost measures). Subsequent assessments, based on assumptions about applying various emission reduction strategies to particular enterprises, were also planned.

The results of risk assessments were also recognized as useful tools in prioritizing emission reduction strategies. For example, a risk assessment can estimate how many instances of a particular disease or how many potential deaths may result from exposure to a specific pollutant, facility, or part of a facility (e.g., fugitive releases versus stack emissions) compared to other pollutants, facilities, or emission points. Such information can focus emission reduction efforts in the strategy development phase on the pollutants and sources of most concern to public health. Results from such assessments can also be used to quantify the benefits (e.g., number of disease cases prevented or deaths avoided) associated with a particular emission reduction strategy and its costs.

ACCOMPLISHMENTS

During 1993-1995, US EPA and VESA staff worked together to produce the air quality data needed as inputs for the risk assessments. Point source emission inventories for the major enterprises were developed and compiled, and the quality of the data was carefully evaluated. In addition to the emissions data, VESA collected information that could affect the release and dispersion of emissions (e.g., stack height, exit temperature and flow rate). A relevant dispersion model was selected and meteorological data for Volgograd were obtained.

Based on these inputs, the Harvard Institute for International Development (HIID) worked with VESA dispersion modelers in 1996-97, in a separate US AID-sponsored

project, to estimate air quality for both total particulates and several specific hazardous air pollutants. These ambient concentrations were combined with health effect data and local population data to predict population risk for Volgograd residents.

Their risk assessment predicted the number of additional deaths that could occur as a result of exposure to ambient particulate levels from 29 point sources throughout Volgograd. This number ranged from 900 to 2,666 deaths per year in a population of about one million. The range reflects the large uncertainties that are associated with the various assumptions used in the assessment. Such ranges are not unusual, given the lack of actual exposure information (such as the time that residents spend indoors versus outdoors, how many years a person may actually reside in Volgograd, the fluctuations in emission rates over time, etc.) and the uncertainties associated with the underlying health effect data. Over 80% of the estimated deaths were associated with emissions from two enterprises - the aluminum plant and the Red October Steel Mill. Carcinogenic risks from exposure to hazardous air pollutants (toxins) were estimated to be negligible relative to the mortality risks from particulates. Results of the risk assessments were conveyed to local policy makers in Volgograd in March, 1997.

IMPACTS

Following the completion of the risk assessment, an analysis of cost-effective options for reducing emissions and associated health risks was undertaken. The options reflected the control measures developed under the Low Cost Measures component of the program. Mortality risks could be reduced for relatively small costs.

Preliminary results of this cost-effectiveness analysis were presented to local officials in Volgograd and at a risk assessment meeting in Moscow in March 1997. As described in the Low Cost Measures report, a precast delta built to reduce fugitive emissions from electric arc furnaces was installed at the Red October Steel Mill and the aluminum plant adopted a paving and regular water spraying program to reduce secondary particulate emissions. Projections of the reductions in mortality that may be realized as a result of implementing these emission reduction options are not currently available.

DOCUMENTATION

"Adopting Cost-Effective Analysis to Risk Management in Russia. A Case Study of Air Pollution Health Risks in Volgograd," HIID.

Principals in the Risk/Health Component

Emma Bezuglaya, MGO
Dianne Byrne, US EPA
Svetlana Kosenkova, VESA
Larisa Vishnevetskaya, VESA

Willis Beal
Component Leader, Public Participation
U.S.EPA

"The response by Volgograd citizens to a more open process and to 'green' issues in general has been gratifying and will help bring wider participation in the future, especially by Volgograd's young people."

PUBLIC PARTICIPATION

BACKGROUND

The public participation component of RAMP was initiated during the second half of the project beginning in May 1995. The initial component plan was modified several times to account for realities of working with the Russian partners. Initial plans called for the formation of a task force to manage a project fund containing subgrant dollars as well as matching funds from local sources. These funds were then to be disbursed on a competitive basis for community-based projects emphasizing active public participation in efforts related to RAMP or air quality issues in general. This plan was subsequently modified in order to accommodate the needs, realities, and time constraints of RAMP implementation.

The Volgograd Citizens Environmental Task Force was formed in the fall of 1995 with twelve representatives from the city administration, non-governmental organizations, businesses, and schools. It was necessary to initiate public participation activities while continuing to work with partners through an open, competitive selection process. Because the Task Force was comprised of a broad representation of public organizations, a sub-agreement with the Task Force to manage a series of public awareness and participation activities was initiated. These initial projects included the following:

- Managing a public and media awareness campaign about environmental issues in Volgograd. Activities included the development of flyers, brochures, and newspaper articles and radio spots on environmental issues, as well as holding a public hearing on pollution issues.

- Developing the Inter-regional Exhibition of Resource Materials - New materials were collected for the traveling exhibition. Permanent branches of the exhibition were established in the northern and southern districts of Volgograd.

- Publishing a directory of Volgograd organizations working on environmental issues - The 40 page directory includes NGOs, governmental offices, schools and university departments as well as private sector organizations involved in environmental matters.

- Organizing of the "Green City Campaign" as a series of tree planting and public information dissemination events held in city parks.

- A "Children's Smoke School" was given for Volgograd students. The classes included general environmental topics focusing on air pollution and visible emissions.

ACCOMPLISHMENTS

"Coalitions were constructed that never before considered each other. The idea of consensus building is a new concept fostered by the public participation program."

Valeria Kotovets
Volgograd, Russia

These activities have achieved the goal of promoting increased awareness of environmental issues by the general public. In addition, a key accomplishment of the participation component was the increased stature and influence of Volgograd NGOs and the development of constructive inter- and intra-sector constructive partnerships. Many of the NGO partners committed to working as part of the RAMP project. Their organizations and their works have been taken more seriously by the city administration as a result. They have also achieved increased access to authorities to get information and to press for their organizational agendas. Moreover, the NGO partners have reported that their work on the Task Force has helped them develop positive working relationships with others from within the NGO community as well as with government and business representatives. In fact, prior to the RAMP project, the individual NGO representatives may have been aware of other groups, but they had never worked together or collaborated. These groups are now better aware of each others' experience, expertise, capabilities and constituencies, and several new collaborative projects outside of the scope of the RAMP project have been developed.

Demonstration of smoke generator for visible emission training at the Children's Atmosphere School in Volgograd.

IMPACTS

An important strength of RAMP was its insistence at the outset of working simultaneously at national and local levels in order to institutionalize project results. The inclusion of public participation activities helped to broaden the effectiveness of the project at the local level, through the establishment of the collaborative relationships discussed previously. An important difficulty, especially for public participation, was the lack of concise, easy-to-read printed information about the overall goals and process of the RAMP component activities. The Russian participation partners waited a very long time to receive these kinds of materials. Additionally, other RAMP component managers were not able to successfully identify opportunities for public participation for their project components. The result was that there was less of an air quality emphasis for public participation activities than originally intended. However, as previously noted, the inclusion of broader environmental issues for public participation has been an important factor in enabling the Task Force to develop concrete activities to work on, resulting in improved organizational relationships.

Valery Azarov, chair of the Volgograd public participation task force

DOCUMENTATION

The Volgograd Citizens Environmental Task Force developed a number of brochures and publications for the general public on a variety of topics, including automobiles and air pollution (5,000 copies), the dangers of mercury pollution, a description of the RAMP project, and a catalog of ecological resource materials. Members of the task force prepared press releases and participated in interviews for nearly 50 newspaper articles and nearly 30 radio and television appearances.

Principals Involved in Public Participation

Valery Azarov, Volgograd Task Force
Willis Beal, US EPA
Roman Kokodiniak, ISC
Valeria Kotovets, Volgograd Task Force
Kevin McCollister, ISC
Susan Wobst, ISC

Susan Wobst
ISC Project Manager
Volgograd

"...the courses have been well received by participants, and have been effective in engaging multiple stakeholders in discussions and environmental issues..."

TRAINING

BACKGROUND

During the last half of the Russian Air Management Project (RAMP), the Institute for Sustainable Communities (ISC) joined US EPA as a project partner to establish a Center for Environmental Training (CET) in Volgograd. The goals of the component were to:

- Provide courses in air and environmental management for public officials, NGOs, industry and business representatives, research institutions, and citizenry. Courses were intended to utilize US interactive teaching methodologies and incorporate Russian content, regulations, legislation and examples.

- Institutionalize the training capacity within the city of Volgograd to ensure that the lessons learned from the RAMP project would continue to be understood and acted upon by future leaders.

- Develop a pool of local facilitators trained to offer the courses and conduct continuing train-the-trainer sessions.

- Ensure that the Center developed managerial ability to continue to serve the needs of the Volgograd region after RAMP formally ended.

- Share training courses and related information with other centers and institutions in Russia.

The CET opened in October 1995 under the auspices of the Russian Ecological Academy. Russian partners of CET included the Volgograd Environmental Services Administration (VESA), the Volgograd City and Oblast Administrations, local industry, business and NGOs, educational institutions, and the Ministry of Environmental Protection and Natural Resources (MEPNR).

Funding for the CET was made available by a grant from the Institute for Sustainable Communities through a cooperative agreement with the US EPA. The project was originally envisioned to last 18 months, from October 1995 through March 1997. An ISC staff member located in Volgograd during this period to support the development of the CET. Due to budget savings by CET, their grant was amended to fully fund them through July 1997, with partial funding for operational support through FY99.

Dr. Svetlana Kosenkova at the opening of the Center for Environmental Training in Volgograd

IMPACT

To date, CET has offered 20 training programs to approximately 400 participants. Newly written courses were taught by facilitators who were trained by their peers. Non-adapted and some adapted courses were delivered initially by a team of experts from US EPA, who subsequently conducted follow-up facilitator training. EPA-trained facilitators from the sister training center in Ekaterinburg also participated in course delivery and facilitator training at CET.

Courses were offered to a broad spectrum of people including government inspectors and specialists at city and oblast levels, industry managers, NGO leaders, research and education professionals, and concerned citizens. CET applied for and received a grant from the Academy for Educational Development (AED) to conduct follow-up training on air quality management. In Spring 1997, CET received its license for ecological education from the Russian Federation State Committee on Nature Protection so that it may officially charge for courses. Receiving the license was part of the sustainability plan that the CET had been developing.

The newly written courses and some of the adapted courses share an eight part modular format that can be taught in three days so they can be interchanged and combined. This flexibility in course structure means that CET can tailor courses to particular audiences. This flexibility enables CET to continue to meet the needs of a variety of single-sector and mixed audiences. The existing courses form a solid core for CET to continue to use and develop.

OBSERVATIONS

The short initial time frame of the project (18 months) within which the organizational development and capacity building aspects of the center needed to be organized presented some drawbacks, given the need to focus on the development of long-term strategic plans. Regarding facilitator training, while CET offered US EPA-delivered courses and adapted several of these courses, only one was offered on a three delivery cycle. The third delivery is most important, because at this point the course is taught by local facilitators while US EPA facilitators or other course leaders observe and critique. During interviews with facilitators, many remarked that they had not received enough facilitator training, and

Air quality seminar at Volgograd Training Center

they wanted more interaction with US EPA facilitators. While CET originally did not support the three cycle delivery, they have acknowledged that this would have provided a larger pool of trained facilitators. The CET continues as a viable organization. Its sustainability is critical to the dissemination of RAMP successes, both in Volgograd and for the entire Russian Federation.

"Startup problems were quickly solved and with the idea of 'train-the-trainer' and using local facilities, we feel the CET has exceeded expectations."

Tatiana Ananskikh
Director, CET
Volgograd, Russia

Katya Koronova and Tanya Ananskikh, CET, holding RAMP achievement award.

Courses Delivered (1995 - 1999)

-- Policy I
-- Economics I
-- Air Quality Management 1
-- Air Quality Management 2
-- Air Quality Management 3
-- Environmental Policy (adapted)
-- Questions of Legislation
-- Water Quality Management
-- Risk Assessment
-- Environmental Economics
-- Financial Management
-- Local Influence on the Technogenic Environmental Biosphere Forming Factors Course
-- Air Quality Management
-- Soil Quality Management
-- Visible Emissions Training and Certification

Principals in Training Component

Tatiana Ananskikh, CET
Willis Beal, US EPA
Barbara Felitti, ISC
Kirk Foster, US EPA
Bennett Knox, US EPA
Katya Koronova, CET
Svetlana Kosenkova, VESA
Lynn Erin McNeil, US EPA
Ivetta Shabunina, Russian Ecological Academy, Volgograd
Michaela Stickney, ISC
Wendy Vit, US EPA
Susan Wobst, ISC

SCOPE

The Russia Air Management Project (RAMP) was an ambitious multi-year, multi-layered project whose purpose was to transfer not only techniques and technology for improving air quality, but to share the American air quality management process to integrate all of these components. The project included a large number of people in both countries and many Russian and American organizations. RAMP was divided into a dozen or more components, jointly managed by Russian and US EPA staff.

The project began with joint US EPA-World Bank interaction with Russian experts, with subsequent funding by US AID. US EPA participation and project management came from OAQPS, with additional participation from US EPA offices in Washington, Denver, Seattle and Chicago. Russian participants came from the State Committee for Environmental Protection in Moscow, the Volgograd Environmental Services Administration and other organizations in Volgograd, and technical experts in Volgograd, Moscow and St. Petersburg. In addition, two American contractors and one American non-profit group were major participants. This wide diversity of participants made for a richly multi-layered project but also a daunting management challenge.

Added to this were the relationships that needed to be developed over the two cultures and the scale of the financial level of the project, some $4 million. The overall management responsibility of RAMP was held by two OAQPS officials, Thompson G. Pace (1992-1995) and Willis P. Beal (1995-1999).

COMMUNICATION

Regular communications between North Carolina and Moscow was challenging because the project crossed eight time zones. When US EPA component leaders from Denver or Seattle were involved, conference calls crossed 10 - 11 times zones. Telephone connections were often low quality and sometimes difficult to make at all. It was not until late in the project that good e-mail connections were possible.

In addition, there was the obvious difficulty with the two languages and more subtle challenge of each culture trying to understand the other. There was a period of developing a comfort level, different for each person, Russian or American. Each person and each side had to take the time to learn how the other conducted business.

PLANNING

The early RAMP planning anticipated that Russia's political system was in the middle of dramatic changes and the future relationships between federal and local environmental officials were difficult to predict. Fortunately, the professionalism of officials at both the SCEP (formerly the Ministry) in Moscow and VESA in Volgograd kept this from being an obstacle. During the project, the SCEP was reorganized and renamed but fortunately the RAMP leadership there remained the same throughout the RAMP.

Although some in RAMP would have preferred to be able to deal with only a single authoritative figure in the Russian government, the facts of life were that the Russian air quality management process is divided at the federal level and between the federal and local levels. The challenge for the US participants was to learn how this worked. The Americans had to understand that the Russian system was in the midst of dynamic change during the project. The remarkable achievement was how well the Russian partners did at keeping project business moving effectively with all the change that was occurring in Russia.

COMMODITIES IMPORT PROGRAM (CIP)

Component leaders had responsibility for their components but, because of situations outside of their control, often were not able to have the most effective coordination possible between components. The most striking example of this involved the ambient monitoring that should have been the beginning baseline for the entire air quality monitoring effort in Volgograd. Because the purchase process for the CIP equipment was managed by a different group within US AID and not the team responsible for working with the RAMP project, there was little that could be done to expedite that process. Because of that, the monitoring that should have occurred early finally happened on a scaled down basis late in the project because of the lengthy delays in that procurement process.

The Commodities Import Program was an independent US AID program designed to foster the utilization of US technologies and equipment in Russia. The RAMP program manager felt that RAMP would benefit if it were allowed to utilize the CIP to furnish air monitoring and source testing equipment to conduct a summer air quality study in Volgograd. This was especially important because the RAMP budget was uncertain and it was not clear if there would be enough money to purchase even a minimal quantity of equipment to conduct a Volgograd study. Unfortunately, there were delays in obtaining the CIP equipment because the CIP program was not linked to either the goals or the schedule of RAMP, the CIP administrative support had limited air quality experience and the eventual suppliers were not well-known to RAMP component leaders. The bottom line was delays and problems in procuring, delivering, training, setting up and operating this equipment. Final equipment delivery was delayed until fall of 1996, nearly at the end of RAMP rather than at the beginning when it could have better reinforced the demonstration of US air quality management techniques.

LOGISTICS

There were layers of government to work with and through on both the Russian and American sides. Besides all the environmental organizations, trips and travelers had to be cleared by both governments and letters of invitation and visas had to be obtained. Visas often came at the last moment, sometimes even to the traveler en route.

Early in the project it was difficult to make travel arrangements with Russia from the US. At times, the US State Department did not allow American government participants to fly on Russian air carriers within Russia because of safety concerns. There were black-out periods for US government staff preventing travel before and during Presidential and Vice Presidential trips to Russia, which forced the rescheduling or cancellation of long-planned trips.

CONTRACTORS/GRANTEES

In addition to the many EPA organizations and Russian governmental organizations working in RAMP, two American contractors — Science Applications International Corporation (SAIC) and Eastern Research Group (ERG)— and one non-profit agency— Institute for Sustainable Communities (ISC)— were part of the project. SAIC assisted with the source assessments and low cost measures as well as with general support of the project, including logistical support from their Moscow office. ERG (formerly Radian) supported measurement and laboratory analysis work. ISC set up the training center and the public participation task force in Volgograd and operated the process for working with several Russian organizations through a sub-grant process.

The scopes of work for many EPA contracts made it difficult to gain access to these contractors at first. International environmental assistance such as this was either not anticipated or excluded from many of the contracts, making it difficult to initiate work. Fortunately, this situation improved over the course of the project.

One contractor, SAIC, had a Moscow office, which was extremely helpful for finding translators, airport pick-ups, moving documents around Russia and support while RAMP teams were in Moscow. When one of the RAMP team members had a heart attack and was hospitalized for an extended time in Moscow, the SAIC and ISC Moscow staffs were extremely helpful in supporting him and his family until he was safely home.

PRACTICAL LESSONS LEARNED

- Both Russian and American participants found that to work together successfully, patience, above all else, was needed, not just technical expertise. Not everyone with technical knowledge had the patience to go over the same ground again and again in order to ensure that everyone had a clear understanding or had the desire to develop an understanding of the other culture and way of doing business. Beyond the excitement of foreign travel there was the reality of the hard work that was necessary to work together to keep the project moving. Participants for future projects should be evaluated for their abilities to work in the sometimes uncertain international environment, not just for their technical expertise.

- Sometimes goals had to be scaled back in order to produce achievable objectives. Rather than trying to work with many enterprises in Volgograd, for instance, the RAMP project eventually focused on a triangle defined by three major industrial sources. This made the project "do-able" and, at the same time, this realistic approach also produced citywide benefits. Actual air quality benefits were never a RAMP objective, but the demonstration of air quality management techniques achieved an estimated 8-12% reduction in air pollution emissions.

- A pilot city for demonstrating the air quality management techniques was absolutely essential, particularly in a large country like Russia. It is the only way to manageably experiment with new techniques, as this project did, and still have the possibility of concrete results. In hindsight, it might have been helpful to also have participation from the oblast (state) level.

- A strong planning effort is needed early with participation by both sides so that there is enthusiastic participation as the project unfolds. An important part of planning is just knowing how each program works, the federal/state/local relationships and the division of authority at each level, such as in this case the monitoring work of RosHydromet and the regulatory work of the State Committee.

- Basic language training for project personnel should be encouraged and facilitated.

- RAMP was a very effective team effort which became stronger as the team worked together. Team training early in the project might have enhanced this development.

- E-mail opportunities are very important now. This capability was nearly nonexistent at the beginning of RAMP but would be heavily relied upon for any project beginning now. Improved translation software is now available, also.

- Conference calls between the US and Russia became a very effective tool. This relatively inexpensive tool made it possible to do a lot of work together before a trip, saving time and money. One of the contractors, SAIC, had an "800" number for conference calls that facilitated the process. The RAMP experience would indicate that this, coupled with the improved e-mail capabilities, would enhance any similar international effort.

- Great care was taken to select the best translators possible throughout the project. While this was not always possible in certain specific meetings, the project developed a cadre of very reliable translators who were vital to the success of meetings and conference calls.

While most of the attention in RAMP was focused on specific components and air quality management techniques, perhaps one of RAMP's most significant accomplishments was getting the entire air quality management process on the table so that everyone could see how the different elements fit together. The management challenge in the project was to keep each element moving as part of a coordinated sequence or to make adjustments when this could not be done, such as with monitoring and the CIP equipment. The US partners now have a better understanding of Russia's air quality program and the Russian partners now have some additional tools to adapt for their program.

Key Participants

Stanislav Markin, SCEP
Svetlana Kosenkova, VESA
Thompson Pace, US EPA (OAQPS)
Willis Beal, US EPA (OAQPS)
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Christine Nasser
Michele Brown
Charles Moseley

Russian Ministry

Vladimir Rezchekov
Evgeni Konygin

Russian Subcontract Reports

APPENDIX A

SCIENTIFIC RESEARCH INSTITUTE FOR ATMOSPHERIC AIR POLLUTION (SRI AAP)

- Russian Cities (RF) That Would Use LCMs
- Air Pollution Method 9 Training Course
- Report on Silica Brick Manufacturing and Heat Power
- Technical Report (brochure) on RAMP
- LCMs Guidance Manual
- Official Russian Documentation for Method 9 Certification
- Traditional Controls for Ferrous and Nonferrous Control
- Study of Air Pollution Control Equipment Industry in Russia (09-93)
- Summary of Air Pollution Control Equipment used in Volgograd (09-93)
- Study of the Volgograd Air Shed (11-93)
- New and Modified Control Technologies for Ferrous and Nonferrous Industries (10-95)
- Certification of Method 9 (10-96)
- Determination of Air Quality Statistics for Public Reporting System (11-95)
- Proposals in Improving PM Monitoring in Selected Cities using the US EPA Process and with Consideration for Volgograd Experiment (Parts I-III) (02-97)
- Existing and Projecting Equipment for Managing Air Pollution from Manufacturing Facilities - Major Sources of Air Pollution. (06-94)

MAIN GEOPHYSICAL OBSERVATORY (MGO)

- Russia Air Quality Report
- Comparative Analysis Using Volgograd Particulate Data
- Development of Twenty-Four Hour Model and Research Software Improvement of Short-Term Concentration Calculation Method for Area Sources (03-96)
- Selection of Russian Cities for which the Monitoring System Should be Developed and Improved (03-95)
- Regulation and Episode Planning (02-95)
- Development of a Model for Calculation of Annual Mean Concentrations (06-96)
- Develop and Improve the Methodology for Summarizing Air Quality Information for Public Use in a City or Geographic Area (07-96)
- The Assessment of the Air Quality Effects on Human Health (05-96)
- Air Quality Trends in Russian Cities

INSTITUTE AGROPROJECT (IA)

- Northern Volgograd Triangle Strategy Data Report
- Particulate Database Using US Methods
- Low Cost Measures Report
- Traditional Control Measures (nine primary Volgograd sources)
- Cost Reports on Nine Primary Volgograd Sources
- Develop a Visible Emissions Baseline Study for Volgograd Enterprises (03-95)
- Develop Cost Estimates for Suggested Control Options for Three Volgograd Enterprises: Low Cost and Traditional Control Measures (08-95)
- Monitoring Studies in Volgograd (02-96)
- Development of the System of Air Quality monitoring in Russian Cities
- Preparation for Summer Monitoring Study (10-94)

INSTITUTE OF NATURAL RESOURCES MANAGEMENT (INRM)

- Pollution Prevention and Operating and Maintenance Improvements and General Characterization on Enterprises' Products and Production (09-94)
- A Study of the Economic Impacts of Air Quality Management in Volgograd (10-94)
- Pollution Prevention and Operating for the "end-of-pipe" Control on the Considering Enterprises (08-94)

ACRONYMS

AED	Academy for Educational Development
APTI	Air Pollution Training Institute
AQM	Air Quality Management
CEIL	Center for Environmental International Law
CET	Center for Environmental Training, Volgograd
CIP	Commodities Import Program
CMB	Chemical Mass Balance
EI	Emission Inventory
ERG	Eastern Research Group
FSU	Former Soviet Union
IA	Institute Agroproject, Volgograd
ISC	Institute for Sustainable Communities
LCM	Low Cost Measures
MGO	Main Geophysical Observatory, St. Petersburg
MEPNR	Ministry of Environmental Protection & Natural Resources, Moscow
NGO	Non Governmental Organization
NIS	Newly Independent States
OAQPS	Office of Air Quality Planning and Standards (US EPA)
OIA	Office of International Affairs (US EPA)
OM	Operation and Maintenance
PM	Particulate Matter
PSI	Pollutant Standards Index
QA/QC	Quality Assurance/Quality Control
RAMP	Russia Air Management Program
SAIC	Science Application International Corporation
SCEP	State Committee for Environmental Protection, Moscow
SRI AAP	Scientific Research Institute Atmospheric Air Pollution, St. Petersburg
US AID	US Agency for International Development
VCETF	Volgograd Citizens Environmental Task Force
VE	Visible Emissions
VESA	Volgograd Environmental Services Administration

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